THE INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY
AN OVERVIEW

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INTRODUCTION

Chemicals are essential for producing and sustaining national development. They are of major importance in virtually every industry, and have a key role in preventing and controlling disease, increasing agricultural productivity and facilitating food storage and preservation. While chemicals have brought many benefits they have also had negative effects on human health and on the integrity of the environment, notably when they are produced, used and disposed of carelessly.

The safe production, use and disposal of chemicals is often seen, mistakenly, as a problem confined to the developed industrialized countries. However, the growing production of chemicals in the developing countries together with increasing international trade means that all countries are now either producers, formulators or users of chemicals and their populations are, therefore, exposed to the possibility of adverse effects. Consequently, chemical safety is relevant to everybody, from national authorities to individuals, because we are all potentially exposed to chemicals in the home, the workplace and the natural environment.

The primary purpose of chemical safety is to ensure that exposure to chemicals, natural as well as synthetic, does not harm humans or the environment. This is not only to avoid the dramatic effects of acute poisoning but also to prevent the possible insidious effects of long-term low-level exposures of large populations.

A large number of chemicals is available commercially throughout the world. For example, about 70,000 listed in the US Toxic Substances Control Act inventory and 100,000 in the European Economic Community's list. However, the volumes of production and use, and the range of uses vary widely. The number of mixtures and formulations in use worldwide is many times greater.

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The number. type and quantities of chemicals used in a specific country depends upon factors such as the national economy, its industrial base and the extent of agriculture. The productivity, ingenuity and competitiveness of chemical industries are noteworthy and innovation is vigorously pursued. Thousands of chemicals are synthesized experimentally each year to determine if they offer advantages over their predecessors and are viable commercially.Of this number, probably about 1,000 enter commerce.The chemical scenario is constantly changing because new chemicals and formulations come on the market, older ones are superseded by better alternatives, and the quantities produced and used vary with demand

CHEMICALS IN COMMERCE

U.S. Toxic Substances Control Act Inventory	*70,000*
European Economic Community List	*100,000*

About 1000 new chemicals enter commerce each year

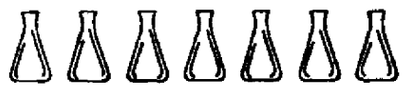

Figure 1

Development of the International Programme on Chemical Safety (IPCS)

It was against this background that IPCS came into being. The IPCS is a cooperative programme of the United Nations Environment Programme (UNEP), the International Labour Office (ILO), and the World Health Organization (WHO). WHO is the executing agency for the programme and the Central Unit of the IPCS is located in the WHO Division of Environmental Health in Geneva, Switzerland.

In 1972 the United Nations Conference on the Human Environment took place in Stockholm, Sweden. The conference reflected international concern about the dangers of chemicals for human health and the natural environment. The conference concluded by recommending that programmes, to be guided by WHO, should be undertaken for the early warning and prevention of the harmful effects of the various environmental agents acting singly or in combination, to which humans were being increasingly exposed, directly and indirectly, and for the assessment of the potential risks for human health.

INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY
is a cooperative program of the

- *World Health Organization (WHO)*
- *United Nations Environment Program (UNEP)*
- *International Labour Office (ILO)*

Figure 2

As the Specialized Agency for Health in the United Nations system WHO has a mandate from its Member States to Address all the factors which have an impact on human health and this includes chemicals. WHO is striving for Health for All by the Year 2000, based on balanced social and economic development, with health both a result of, and a key factor in, this development

In 1977 the World Health Assembly requested the Director-General to study the problem of long-term strategies to control and limit the impact of chemicals on human health and the environment. On this basis a programme was developed and structured by WHO The interest of other international organizations in chemical safety was clearly demonstrated by ILO and UNEP joining with WHO in the IPCS which was formally launched in 1980 when a Memorandum of Understanding (MOU) was signed between the three organizations

Objectives of the IPCS

The objectives are to catalyze and coordinate activities in relation to chemical safety, and in particular to:

(i) carry out and disseminate **evaluations** of the risk to human health and the environment from exposure to chemicals, mixtures of chemicals or combinations of chemicals and physical and biological agents,

(ii) promote the development, improvement, validation, and use of **methods** for laboratory testing and ecological and epidemiological studies and other methods suitable for the evaluation of health and environmental risks and hazards from chemicals;

(iii) promote **technical cooperation** with Member States, in particular developing countries to:

OBJECTIVES OF THE IPCS

- *Carry out and disseminate evaluations of the risks to human health and the environment from exposure to chemicals*
- *Promote the development, improvement, validation and use of methods for testing chemicals*
- *Promote technical cooperation with Member States, and, in particular, developing countries*

Figure 3

(a) facilitate the use of available evaluations of health and environmental risks and hazards from chemicals,

(b) improve the capabilities of national authorities in conducting their own evaluations of health and environmental risks and hazards from chemicals;

(c) strengthen infrastructures for safety aspects relating to chemicals —their production, importation, transportation, storage, use, and disposal,

(iv) promote effective international co-operation with respect to **emergencies and accidents** involving chemicals;

(v) support national programmes for **prevention and treatment** of poisonings involving chemicals,

(vi) promote **training** of the required manpower.

OBJECTIVES OF THE IPCS

- *Promote effective international cooperation with respect to emergencies and accidents involving chemicals*
- *Support national programs for prevention and treatment of poisonings involving chemicals*
- *Promote Training of the require manpower*

Figure 4

In order to ensure efficient use of resources and integration of the results the IPCS works closely with other international and WHO programmes which are also involved in the area of safe use of chemicals. Examples are collaboration with the Council for Mutual Economic Assistance (CMEA), the Organization for Economic Research and Development (OECD), the Commission of the European Communities (CEC) and the WHO programmes on environmental pollution, occupational health, safe use of pesticides and food safety. There is close collaboration with the Food and Agriculture Organization (FAO) for the joint safety evaluations of food additives, pesticide residues in food and veterinary drug residues in meat

ACTIVITIES AND OUTPUTS OF THE IPCS

For each objective of IPCS there are specific outputs. These include the worldwide dissemination of information and publications directed to a wide range of readers, meetings of international experts and training courses for students from many countries.

Publications on Risk Assessment

Environmental Health Criteria (EHC) Documents

This Environmental Health Criteria Document series covers evaluations of specific chemicals or groups of chemicals, monographs dealing with methodology and monographs on physical hazards

Seventy-three EHC documents have been published, two are in press, and thirty-nine are in various stages of preparation. Of those published there are fifty-five monographs on chemicals, ten on methodology and eight on physical hazards. These documents, prepared in collaboration with experts from all parts of the world, review and evaluate current knowledge and provide a basis for assessment of hazards.

Priority chemicals for assessment by IPCS and publication as EHCs are identified with the participation of international experts and in collaboration with IARC, IRPTC and allied WHO programmes. A new list has recently been prepared based on inputs from international bodies, governments and industries using broad selection criteria such as quantity of production, types and extent of uses, toxicity, ecotoxicity and environmental persistence.

OUTPUTS of IPCS

Environmental Health Criteria Documents (EHC)

- *detailed evaluations of specific chemicals*
- *73 published (55 on chemicals)*
- *2 in press*
- *39 in preparation*

Figure 5

Health IPCS publications are disseminated widely to international organizations, national authorities, and scientific and industrial associations to provide a basis for chemical safety planning and for the development and implementation of control measures. The documents are available in English and French and many have been translated into other languages

Health and Safety Guides (HSGs)

Health and Safety Guides have been designed to make information on chemicals more widely available. They are intended to meet the needs of a wide range of administrators, managers and decision-makers in governmental ministries and agencies, and in commercial and industrial undertakings to enable them to achieve chemical safety and avoid human and environmental health hazards. Health and Safety Guides are short documents summarizing in simple, non technical language the relevant physical and chemical properties and evaluated information on toxicity and ecotoxicity. They give practical advice on safe storage, handling and disposal, accident prevention, and human health and environmental protection measures. First aid and medical treatment in cases of human exposure and clean-up procedures for environmental contamination are important sections for handling emergencies HSGs also give information on permitted occupational exposure levels and other limits for a range of countries. The aim is to keep these booklets concise and use a simple style and presentation to ensure that the advice is easy to read, understand and apply. Simplicity of

OUTPUTS of IPCS

Health ans Safety Guides

- *short documents summarizing relevant data on physical and chemical properties and information on toxicity*
- *11 published or in preperation*
- *64 to be produced in 1988/89*

Figure 6

text facilitates translation into other languages. To date, eleven HSGs have either been published or are in press. HSGs for another sixty-four chemicals will be produced in 1988–89. HSGs are prepared routinely for all the chemicals reviewed and evaluated in EHCs and also for other priority chemicals.

International Chemical Safety Cards (ICSCs)

International Chemical Safety Cards are being developed to provide a simple summary of essential identity data and health and safety information on a card (or poster). They are designed for use by people who use chemicals in their work or may be involved with them in storage and transportation. The cards also provide useful information to people involved in handling cases of poisoning such as "first aiders", workplace safety officers, police, firemen, para-medical personnel, and primary health care workers. It is hoped that a standard format for the cards will ensure wide acceptability, easy use and facilitate translation into many languages. IPCS plans to publish International Chemical Safety Cards on 400 chemicals in 1988–89.

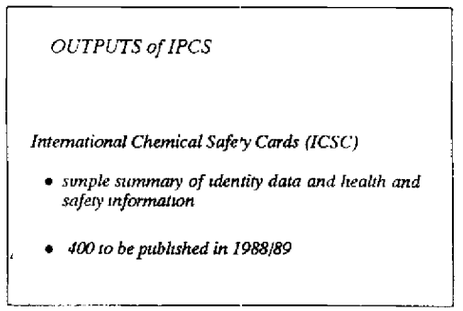

Figure 7

Monographs on i) Food Additives and ii) Pesticide Residues in Food

IPCS is also involved in the production of monographs on specialty chemicals. In collaboration with FAO, the IPCS has evaluated or re-evaluated more than 200 food additives, food contaminants and growth-promoting agents in order to establish acceptable daily intakes. For pesticides, maximum residue levels in food have been set for 140 used extensively in agriculture and public health. Monographs are published annually and the evaluations provide information on toxicology and safe levels of exposure and assist governments in establishing permissible legal levels of these substances in foodstuffs. Veterinary drugs are now coming under similar scrutiny because their use can leave residues in meat and similar evaluations will be made by an expert advisory committee.

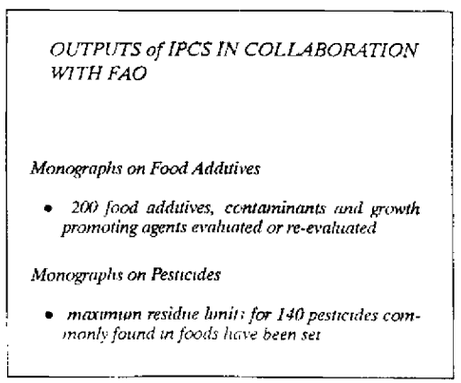

Figure 8

Development of Methodology

An important task of the IPCS is to foster the development of internationally accepted approaches and methods for testing, assessing and predicting the effects of chemicals on human health and the environment. In this context, human epidemiological studies linked with chemical exposure on a global level are important. Such test methods will facilitate comparability, general acceptance and use of data obtained in different countries and promote effective chemical safety. These international activities will bring national test methods closer together and also produce a better understanding of the philosophy and scientific basis for testing.

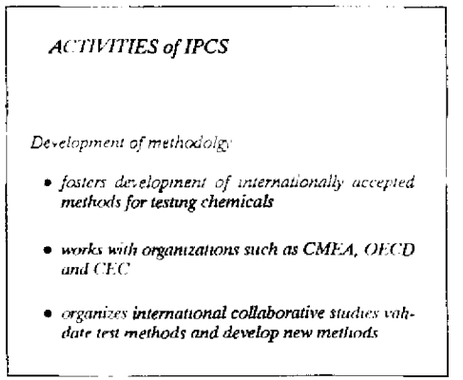

Figure 9

In this area IPCS works closely with intergovernmental organizations such as the Council for Mutual Economic Assistance (CMEA), the Commission of the European Communities (CEC), and the Organization for Economic Cooperation and Development (OECD) and with scientific groups. This ensures coordination and avoids duplication of effort and waste of scarce resources. The involvement of IPCS contributes to the work of other organizations because it facilitates truly international understanding and agreement on the basic principles on which national requirements for testing and assessing chemicals for their toxic and ecotoxic effects can be based. A crucial part of the development of methodology is publication of monographs which provide a critical analysis of current test methods and approaches to predicting health and environmental risks. Better testing strategies for producing more reliable and comparable results are developed in these monographs.

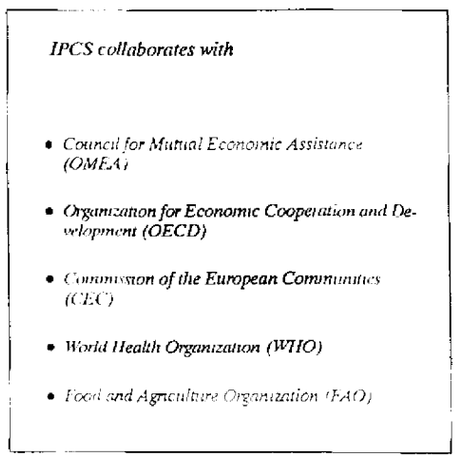

Figure 10

Another important IPCS activity in the field of methodology is the organization, coordination and facilitation of interlaboratory collaborative studies aimed at validating existing test methods, developing new methods and improving the interpretation of results. This is generally confined to the

conduct of tests where the international cooperation of scientific bodies and institutions is essential for the work to be carried out satisfactorily and meaningful results produced. Other intergovernmental and scientific organizations may collaborate with IPCS in these studies. Currently international collaborative studies are being planned for neurotoxicity and immunotoxicity, and it is hoped that they will begin this year.

An outstanding feature of the development of methodology is the active participation of scienusts from all over the wolrd This participation, and the interactions between individual scientists and institutions, contribute greatly to the harmonization of testing and risk assessment in the developing, industrializing countries as well as in the developed countries. An international approach to the principles and methodology of risk assessment is of particular benefit to countries where rapid industrialization and expansion of agriculture give rise to serious potential hazards from chemicals because their scientists normally have to use data and risk assessments generated elsewhere and apply them to their own national situation Participation also directly contributes to the development of scientific and institutional expertise at national level.

Management of Chemical Emergencies

The large number and volume of chemicals extracted, manufactured, transported, marketed, stored, used and disposed of as wastes, constitute a significant risk of accidental exposure and poisoning. Accidents ranging from major catastrophes to minor leakages and spills occur frequently. More rational and effective approaches are needed to prevent, or where prevention fails, to tackle the consequences of chemical accidents in order to avoid damage to human health and the environment. At a practical level, IPCS is working with the World Federation of Clinical Toxicology Centres and Poison Control Centres to define the type of information and institutional capacity required for the treatment of poisoning and structured poison prevention and control programmes. The clinical diagnosis and treatment of poisoning is now a regular feature of EHC documents on chemicals and Health and Safety Guides. Special attention is given to specific antidotes and their use, although it must be recognized that these are available for relatively few chemicals; frequently, general supportive treatment is all that can be given. A primary aim is to make developing countries, whose populations experience a high proportion of poisoning by chemicals, self sufficient in poison control and treatment. The training of manpower and production of teaching materials is an important part of this activity.

ACTIVITIES of IPCS

Management of Chemical Emergencies

- *works with the World Federation of Clinical Toxicology Centres and Poison Control Centres*
- *aim is to make developing countries self sufficient in poison control and treatment*

Figure 11

Manpower Development in the Field of Chemical Safety

The capacity of countries to ensure the safe use of chemicals and to adapt to their needs toxicological and ecotoxicological data and risk assessments made elswhere is conditioned by the availability of resources (financial, individual, and institutional) as well as scientific and managerial

expertise. Achieving chemical safety requires governmental initiative, trained manpower and an informed population. The IPCS gives high priority to manpower development and promotes training in understanding the nature of chemical hazards, the uses of toxicological and ecotoxicological test data, risk assessment and safe use of chemicals under a variety of conditions.

ACTIVITIES of IPCS

Manpower Development

- *priority given to training manpower in assessing toxicological and ecotoxicological test data risk assessment and safe use of chemicals*
- *training material are prepared and workshops and seminars organized*

Figure 12

Training materials are prepared and courses and seminars are organized. Training materials and approaches to training must be adapted to meet the needs of different countries to make them selfreliant and able to manage their own chemical safety and training programmes. Workshops are organized to promote chemical safety, provide awareness of the practical uses of toxicology and ecotoxicology and stimulate the development of national programmes. The majority of training activities are founded and organized jointly with other international and national bodies. Activities organized with national authorities are specially valuable because they provide a firm foundation on which countries can develop and run their own courses.

Technical Cooperation

Technical cooperation is an integral part of all IPCS activities. In the World Health Organization technical cooperation is a primary responsibility of Regional Offices. WHO is divided into six Regions. Each Region defines its priorities for health based on the conditions prevailing within its countries. Some Regions already have established programmes dealing with chemical safety and others are in the process of doing so. To deal with the increasingly complex health and environmental problems caused by the use of chemicals, it is obviously in the interest of all to share knowledge and resources. Scientific knowledge needs to be shared otherwise developing countries will not be able to achieve the expertise needed to tackle their problems. The IPCS has a key role because it is directed to international cooperation rather than isolated national efforts.

ACTIVITIES of IPCS

Technical Cooperation

- *an integral part of all IPCS activities*
- *necessary to share knowledge when dealing with complex health and environmental problems*
- *public demand for protection from adverse effects of chemicals is world wide*

Figure 13

In conclusion, the major responsibility for the safety of chemical substances lies with the producers. Prevention is the only effective strategy for the control and management of chemical hazards. And, because of the global nature of the problems caused by chemicals, both

national and international efforts are needed. Public demand for protection from chemical (and other) hazards is not unique to any one country. Assessments of risk and hazard provided by IPCS and its internationally recognized and independent experts have an important role to play in ensuring chemical safety worldwide.

ENVIRONMENTAL HEALTH CRITERIA DOCUMENTS

1. Mercury
2. Polychlorinated Biphenyls and Terphenyls
3. Lead
4. Oxides of Nitrogen
5. Nitrates, Nitrites, and N-Nitroso Compounds
6. Principles and Methods for Evaluating the Toxicity of Chemicals, Part I.
7. Photochemical Oxidants
8. Sulfur Oxides and Suspended Particulate Matter
9. DDT and its Derivatives
10. Carbon Disulfide
11. Mycotoxins
12. Noise
13. Carbon Monoxide
14. Ultraviolet Radiation
15. Tin and Organotin Compounds
16. Radiofrequency and Microwaves
17. Manganese
18. Arsenic
19. Hydrogen Sulfide
20. Selected Petroleum Products
21. Chlorine and Hydrogen Chloride
22. Ultrasound
23. Lasers and Optical Radiation
24. Titanium
25. Selected Radionuclides
26. Styrene
27. Guidelines on Studies in Environmental Epidemiology
28. Acrylonitrile
29. 2,4-Dichlorophenoxyacetic Acid (2,4-D)
30. Principles for Evaluating Health Risks to Progeny Associated with Exposure to Chemicals during Pregnancy
31. Tetrachloroethylene
32. Methylene Chloride

33. Epichlorohydrin
34. Chlordane
35. Extremely Low Frequency (ELF) Fields
36. Fluorine and Fluorides
37. Aquatic (Marine and Freshwater) Biotoxins
38. Heptachlor
39. Paraquat and Diquat
40. Endosulfan
41. Quintozene
42. Tecnazene
43 Chlordecone
44. Mirex
45. Camphechlor
46. Guidelines for the Study of Genetic Effects in Human Populations
47. Summary Report on the Evaluation of Short-Term Tests for Carcinogens (Collaborative Study on In Vitro Tests)
48. Dimethyl Sulfate
49 Acrylamide
50. Trichloroethylene
51. Guide to Short-Term Tests for Detecting Mutagenic and Carcinogenic Chemicals
52. Toluene
53 Asbestos and Other Natural Mineral Fibres
54. Ammonia
55. Ethylene Oxide
56. Propylene Oxide
57. Principles of Toxicokinetic Studies
58. Selenium
59. Principles for Evaluating Health Risks from Chemicals During Infancy and Early Childhood: The Need for a Special Approach
60. Principles and Methods for the Assessment of Neurotoxicity Associated With Exposure to Chemicals
61. Chromium (in press)
62. 1,2-Dichloroethane
63. Organophosphorus Insecticides - A General Introduction
64. Carbamate Pesticides - A General Introduction
65. Butanols - Four Isomers
66 Kelevan
67. Tetradifon
68. Hydrazine
69. Magnetic Fields

70 Principles for the Safety Assessment of Food Additives and Contaminants in Food
71 Pentachlorophenol
72. Principles of Studies on Diseases of Suspected Chemical Etiology and their Prevention
73. Phosphine and Selected Metal Phosphides
74. Diaminotoluenes
75. Toluene Diisocyanates
76 Thiocarbamate Pesticides - A General Introduction
77. Man-Made Mineral Fibres

HEALTH AND SAFETY GUIDES

Acrylonitrile
Kelevan (1986)
Methylene Chloride (1987)
Tetrachloroethylene (1987)
1-Butanol (1987)
2-Butanol (1987)
Tert-Butanol (1987)
Isobutanol (1987)
2,4-Dichlorophenoxyacetic Acid (2,4-D) (1987)
Epichlorohydrin (1987)
Tetradifon (1987)
Chlordane (1987)

In preparation

Heptachlor
Quintozene
Tecnazene
Ethylene Oxide
Propylene Oxide
Aldrin and Dieldrin
Pyrrolizidine Alkaloids
Dimethoate
Endosulfan
Pentachlorophenol
Dichlorvos
Cypermethrin
Resmethrins
Allethrins
Phosphorus Trichloride

Phosphorus Oxychloride
Phosphine
Formaldehyde
Diaminotoluene
Toluene Diisocyanates
Toluene
d-Phenothrin
Permethrin
Fenvalerate
Dimethylformamide
Camphechlor
Mirex
Chlordecone
Paraquat
Diquat
Tetramethrin
Deltamethrin
Cyhalothrin
1-Propanol
2-Propanol
Beryllium
Nickel
Magnetic Fields
Hydrazine
1,2-Dichloroethane
Ammonia
Dimethyl Sulfate
Phenol
Vanadium
Acrylamide
Acetaldehyde
Acroleine
Aldicarb
Chlorobenzenes
Chlorophenols
Endrin
Ethylbenzene
Fenitrothion
Hexachlorobenzene

Hexachlorobutadiene
Hexachlorocyclopentadiene
Isobenzan
Malathion
PCBs/PCTs
Propachlor
Selected Glycol Ethers
Trichlorphon
Xylenes